## CLAS12 Slow Controls Operations Manual - v1.5

(Dated: January 8, 2017)

## I. Overview

The operator interface for the Hall B controls systems is based on Control System Studio (also called CS-Studio or CSS) and allows access to all the necessary EPICS tools from a single application. This system is accessible locally by user clasrun from all clonpc## desktop computers in the Hall B Counting Room for shift workers. There are also clonsl# servers for remote use with access to the same software. All controls computers are behind JLab's hallgw gateway and require 2-factor authentication for remote access.

To start the control system with only the main menu as shown in the left panel of Figure 1, in a terminal run:

#### clascss

To start the control system with the full alarm handler as shown in the right panel of Figure 1, in a terminal run:

	Alarm Area Panel 😫	-	🗖 🔛 Display 🔀							- 0
clos	CND	CTOF DC			Select Node		100	Title h	ere	
Page Experts	ECAL	FTC FTH			B_SYS_HV B_SYS_HV_ECAL_S		80 - 60 - 40 -			
CTOF	FTOF	FTT HTCC	B_SYS	S_HV			0 5 10 15 2	0 25 30 35 40 45 5	0 55 60 65 70 75 80 85 9	0 95 100
DC ECAL	LTCC	CAL				📕 Status 🥥	CND CTOF FTT HTCC	DC ECAL	FTC FTH FTO	
FT	🙀 Alarm Tree 😫		Controls	Monitoring						
LITCO	nottest v	ts ≪ ✓ I I I	p	E	SYS_HV_E	CAL_SEC2_UI Co	ontrols			
ITCC			₩ #	Description	Pw Vmon	mon Status Vset (\	v) Iset (uA)	Vmax (V) Up (1	//s) Down (\//s)	
PICH I	System: CND			ECAL_HV_SEC2_UI_E36	0.500	0.00 InTrip 1850.000 1	850.000 500 500 2	500 2500 50	50 100 100	
SVT	🗄 🔵 System: CTOF									
301	🗉 🗳 System: DC		III Alarma Tabla S							
Subsystems	🗄 🛑 System: ECAL (MAJOR	(HIGH_ALARM)	Marm Table [	Hottest) 23				P.0		
Beamline	🗉 🗧 System: FTC		Current Alarms	(3)		Sel	lect			~ ×
Devices	🕀 😑 System: FTH		PV	✓ Description		Alarm Time	Current Se	v Current Sta A	larm Seve Alarm Statu	Alarm Value
Gas System	🕀 😑 System: FTOF		😵 B_SYS_HV	PCAL_SEC2 MAJOR alarm: H	igh Voltage alarm for B_	SYS_HV_ 2016/11/10 14:32:22	2.376 OK	NO_ALARM M	IAJOR HIGH_ALARM	I HIGH
HV	🕀 😑 System: FTT		8 B_SYS_HV	ECAL_SEC2 MAJOR alarm: H	igh ∨oltage alarm for B_	SYS_HV_ 2016/11/10 14:22:00	0.791 MAJOR	HIGH_ALARM	IAJOR HIGH_ALARM	HIGH
IDCs	🗄 😑 System: HTCC		8 B_SYS_HV	ECAL_SEC2 MAJOR alarm: H	igh ∨oltage alarm for B_	SYS_HV_ 2016/11/10 14:22:00	0.790 MAJOR	HIGH_ALARM N	IAJOR HIGH_ALARM	HIGH
Moeller	🗄 😑 System: LTCC									
Matara	System: PCAL (MAJOR)	(HIGH_ALARM)								
Buckey	H System: SEC1		Acknowledged	Alarms (0)						
Scalers	E System: SEC2 (MA)	OR/HIGH_ALARM)	PV	✓ Description		Alarm Time	Current Se	v Current Sta A	larm Seve Alarm Statu	Alarm Value
Solenoid	E System: U									
Torus	Bystern. V (MAjor									
DAQ Crates	PV: B_SYS_HV	PCAL_SEC2_V_E01.STAT								
Tools	PV: B SYS HV	PCAL SEC2 V E03.STAT								
Strip Charts	PV: B SYS HV	PCAL SEC2 V E04.STAT								
	PV: B_SYS_HV	PCAL_SEC2_V_E05.STAT								

#### clascss-alarm

FIG. 1: On the left is the main CLAS12 controls menu showing locations of buttons used for the accelerator's JMenu screens (blue), paging Hall-B experts (pink), and restarting IOCs (yellow). On the right is the alarm controls screen.

The main menu is organized in a hierarchy of subsystems and components. The top portion of the menu is for specific detectors, while the bottom portion is for more general subsystems. The alarm screen is organized into different regions described in the following sections.

### II. Alarms

The user frontend of the alarm handling system runs in CS-Studio and includes visual and audible alarms. The default alarm view when running clascss-alarm is shown in the right panel of Figure 1. On the left are the *Area Panel*, an overview of the systems' alarm statuses, and the *Alarm Tree*, a hierarchical view of all alarm settings. The right side contains the *Alarm Table* (see also Figure 2), a list of active alarms that should be addressed and a separate list of already acknowledged alarms.

<b>III</b> A	larm Table (	[nottest] 없	) Annunciator				🔊   🖌 🕴	5 TA T	~
Cur	rent Alarms	; (3)		Select					×
	PV	~	Description	Alarm Time	Current Sev	Current Sta	Alarm Seve	Alarm Statı	Alarm Value
٨	B_SYS_HV	_PCAL_SEC2_	MAJOR alarm: High Voltage alarm for B_SYS_HV_	2016/11/10 14:32:22.376		NO_ALARM	MAJOR	HIGH_ALARM	HIGH
8	B_SYS_HV	_ECAL_SEC2_	MAJOR alarm: High Voltage alarm for B_SYS_HV_	2016/11/10 14:22:00.791	MAJOR	HIGH_ALARM		HIGH_ALARM	HIGH
8	B_SYS_HV	_ECAL_SEC2	MAJOR alarm: High Voltage alarm for B_SYS_HV_	2016/11/10 14:22:00.790	MAJOR	HIGH_ALARM		HIGH_ALARM	HIGH
-									
Ack	nowledged	Alarms (0)							
	PV	~	Description	Alarm Time	Current Sev	Current Sta	Alarm Seve	Alarm Statı	Alarm Value

FIG. 2: The *Alarm Tree* portion of the alarm screen, showing an example of three outstanding alarms that need to be addressed. The first is no longer in an alarm state (denoted by the *OK* in the *Current Severity* column), and none of the three have been acknowledged (or else they would have appeared instead in the lower *Acknowledged Alarms* section).

By right-clicking on an alarm in the *Alarm Table*, a dropdown menu of actions is accessible (see Figure 3). This dropdown list contains access to a *Guidance* screen with instructions that should be read and followed on how to deal with the specific alarm. The next step is to acknowledge the alarm using the *Acknowledge* option in the dropdown menu, which will silence the alarm and move it to the *Acknowledge Alarms* section until it is no longer in an alarm state. For many alarms there is also an option in the dropdown menu starting with *Open* that will open a screen necessary to address the specific alarm using the information from the *Guidance* screen.



FIG. 3: An example dropdown menu accessible by right-clicking on an alarm in the *Alarm Table*. Important visible actions include a *Guidance* button, an *Open* screen action, and the *Acknowledge* action.

## III. IOCs

EPICS input-output controllers (IOCs) are the backend responsible for the actual communication with the hardware devices in the hall. Figure 4 illustrates access to the IOC controls screens from the main CLAS12 menu, as well as the overview IOC heartbeat screen. The heartbeats should be flashing at 1 Hz for all IOCs, or else the IOC may be in need of reboot. By clicking on the IOC in the heartbeat screen (or the IOC health group in the main menu), controls to monitor and reboot the IOCs can be accessed, and an example is shown in Figure 5. Systems are in place to automatically start all necessary IOCs if for any reason they are not running (e.g. recovery from a power outage), however occaisonally a manual reboot is required.

	iences			iaadaha CIRI	
	ioccas		100	inclute C1D2	0
	IOCHECCIV	$\overline{\mathbf{O}}$	IOC	iocaciv_SIR2	
	iocttagiv	0	Heartbeats	iocdclv_S1R3	
	iocftcTemps	0		iocdclv_S2R1	0
	iocttcChiller	0		iocdclv_S2R2	0
	iocftcFlasher	0	ioccaenhv_HVECAL1 😑	iocdclv_S2R3	0
	ioctorusCryo	0	ioccaenhv_HVECAL2 😑	iocdclv_S3R1	0
	ioctorusForce	0	ioccaenhv_HVECAL3 🔘	iocdclv_S3R2	0
	ioctorusMps	0	ioccaenhv_HVECAL4 🔘	iocdclv_S3R3	0
	ioctorusQD	0	ioccaenhv_HVECAL5 😑	iocdclv_S4R1	0
	ioctorus∨ac	0	ioccaenhv_HVECAL6 😑	iocdclv_S4R2	0
	iocgasSystem	$\overline{}$	ioccaenhv_HVFTOF1 😑	iocdclv_S4R3	0
	iocgasSystem86	$\circ$	ioccaenhv_HVFTOF2 😑	iocdclv_S5R1	
	iocvmeCrates	0	ioccaenhv_HVFTOF3 🔵	iocdclv_S5R2	
	iocctoflv	Di	ioccaenhv_HVFTOF4 😑	iocdclv_S5R3	
IOCs	iocgenFlasher	Di	ioccaenhv_HVFTOF5 🧿	iocdclv_S6R1	
	iocmoellerPS	Di	ioccaenhv_HVFTOF6 🧿	iocdclv_S6R2	
Heartbeats	iocmoellerTarget		ioccaenhv_HVCTOF0 🧿	iocdclv_S6R3	0
IOC Health	iocmoellerCalib	Di	ioccaenhv_HVFTAG	in sincelore 1	
loc riealth	iocfthDivider		ioccaenhv_HVLTCC0 🔘	iocjscalers1	
HV IOC Health	iocclassc1	0	ioccaenhv_HVDC Di	iocjscalers2	
IScalers IOC Health	iocclassc3	Di		iocjscalers3	
Dely (loc Linebh	iocclassc4	0		iocjscalers4	$\sim$
DCLV IOC Health	iocclassc6	õ		locjscalers5	
CA Gateway Stats	iocclassc8	Di		locjscalers6	$\sim$
	iocclassc12	Di		lociscalersC	$\overline{}$
Torus					

FIG. 4: Dropdown menu (left) from the *IOCs* button in the main CLAS12 controls menu showing links to health screens for subsets of IOC groups, and the IOC heartbeat overview screen (right).

IOC Health												
softiocs												
3011023					~ ^							
IOC Name	Hostname	Up Time	Heartbeat	Expert	Soft Reboot	Last Reboot	Conso	e Reboot	Status	Message	Recently E	xpert
ioccas	clonioc1.ilab.org	15 days, 00:19:00	1297140	51	Reboot	10/25/2016 13:57:47	<b>г</b> 7	Reboot	Warning	2 values not saved	Wrote 'cas_settings.sav1'	5
iochtcclv	clonioc2.ilab.org	43 days, 21:55:55	3794155	N	Reboot	09/26/2016 16:20:51		Reboot	,			
iocctofly	Disconnected	Disconnected	Disconnected	R.	Reboot	Disconnected	2	Reboot	Disconnecte	Disconnected	Disconnected	51
iocftaglv	clonioc2.jlab.org	22 days, 05:36:40	1921000	R	Reboot	10/18/2016 08:40:06	r'i	Reboot	Disconnecte	Disconnected	Disconnected	2
iocftcTemps	clonioc1.jlab.org	15 days, 00:19:00	1297140	12	Reboot	10/25/2016 13:57:47	N	Reboot	Ok	Ok	e 'OmegaCYD218 All settings	<b>N</b>
iocftcChiller	clonioc1.jlab.org	15 days, 00:19:01	1297141	E.	Reboot	10/25/2016 13:57:46	R	Reboot	Ok	Ok	Wrote 'info positions.sav1'	EN I
iocftcFlasher	clonioc1.jlab.org	15 days, 00:19:29	1297169	R	Reboot	10/25/2016 13:57:18	R	Reboot				
ioctorusCryo	clonioc1.jlab.org	14 days, 00:14:53	1210493	E.	Reboot	10/26/2016 14:01:54	R	Reboot	Ok	Ok	Wrote 'info_positions.sav2'	E2
ioctorusDaq	clonioc1.jlab.org	7 days, 01:59:38		Ľ	Reboot	11/02/2016 12:17:09	Ľ	C Reboot	Ok		Wrote 'info_positions.sav0'	Ľ
ioctorusForce	clonioc1.jlab.org	15 days, 00:18:59	1297139	C <sup>2</sup>	Reboot	10/25/2016 13:57:47	Ľ	Reboot	Ok		Wrote 'info_positions.sav1'	ß
ioctorusMps	clonioc1.jlab.org	13 days, 01:00:28	1126828	Ľ	🖸 Reboot	10/27/2016 13:16:19	Ľ	🖸 Reboot	Ok		Wrote 'torus_mps_settings.sav	2 12
ioctorusQD	clonioc1.jlab.org	7 days, 00:16:44	605804	Ľ	🖸 Reboot	11/02/2016 14:00:02	Ľ	🖸 Reboot	Ok		Wrote 'info_positions.sav0'	L, L
ioctorusVac	clonioc1.jlab.org	15 days, 00:19:00		Ľ	🖸 Reboot	10/25/2016 13:57:47	Ľ	🖸 Reboot	Ok		Wrote 'info_positions.sav1'	Ľ
iocgasSystem	clonioc1.jlab.org	7 days, 22:18:59	685139	Ľ	🖸 Reboot	11/01/2016 15:57:48	Ľ	🖸 Reboot	Ok		Wrote 'info_positions.sav1'	Ľ
iocgasSystem86	svtsystem1.jlab.org	5 days, 02:40:39		Ľ	🖸 Reboot	11/04/2016 11:36:08	Ľ	🖸 Reboot	Ok		Wrote 'info_positions.sav1'	Ľ
ioccagw	clonioc1.jlab.org	15 days, 00:19:00	1297140	Ľ	🖸 Reboot	10/25/2016 13:57:47	Ľ	🖸 Reboot	Ok		Wrote 'info_positions.sav0'	Ľ
iocgenFlasher	Disconnected	Disconnected	Disconnected	Ľ	🖸 Reboot	Disconnected	Ľ	🖸 Reboot				
iocvmeCrates	clonioc2.jlab.org	43 days, 03:25:15		Ľ	🖸 Reboot	09/27/2016 10:51:32	Ľ	🖸 Reboot				
iocmoellerPS	Disconnected	Disconnected	Disconnected	Ľ	🖸 Reboot	Disconnected	Ľ	🖸 Reboot	Disconnecte	Disconnected	Disconnected	Ľ
iocmoellerTarget	clonioc1.jlab.org	15 days, 00:19:00	1297140	Ľ	🖸 Reboot	10/25/2016 13:57:47	Ľ	🖸 Reboot				
iocmoellerCalib	Disconnected	Disconnected	Disconnected	Ľ	🖸 Reboot	Disconnected	Ľ	🖸 Reboot	Disconnecte	Disconnected	Disconnected	Ľ
iocmonitor	clonioc2.jlab.org	2 days, 23:05:37	255937	C.	Reboot	11/06/2016 14:11:09	Ľ	Reboot				
VME IOCS												
					<b>-</b> · ·					Autosave		
IOC Name	Hostname	Op rime	Heartbeat	Expert	Reboot	Last Reboot	Sta	tus	Message		Recently Expert	
iocclassc1	classcl	57 days, 02:12:12	4932732	E C	Reboot	09/13/2016 11:04:34						
locclassc4	classc4	161 days, 17:16:03	13972563	2	Reboot	05/31/2016 20:00:43						
iocclassc6	classc6	161 days, 17:14:06	13972447	2	Reboot	05/31/2016 20:02:40	_				· · · ·	
IOCCIASSC8	Disconnected	Disconnected	Disconnected		L Reboot	Disconnected					· · ·	

FIG. 5: The primary IOC health screen showing uptime, heartbeats, and autosave status for each IOC, and buttons to restart them. Pink rows designate IOCs that are not currently running in this screenshot, but under normal operations all rows should have normal readings.

## IV. High Voltage

The largest controls system in Hall B in terms of number of channels is high voltage (HV), with 23 CAEN crates including SY527, SY1527, and SY4527 mainframes. An overview screen of the status of all HV in Hall B is accessible from the HV button in the main CLAS12 menu as shown in Figure 6. Clicking on a detector in this overview screen will bring up the HV controls for that detector (also accessible under each detector's button in the main menu).



FIG. 6: Access to the HV overview screen from the main menu (left). Clicking on a detector's name in the overview screen (right) will open its HV controls screen.

#### V. Strip Charts

There are two applications available for plotting time histories of slow controls variables: Strip-Tool and MyaViewer. Both are available from the *Strip Charts* button at the bottom of the main CLAS12 controls menu as shown in Figure 7.

The suggested tool for online operations in Hall B is StripTool, which has no access to archived data but is very robust and stable. MyaViewer is ideal for expert studies and can access the Mya archive used to store previous years of Hall B controls data. In either case, configuration files are loadable from their user interfaces to view a predetermined set of variables, or else you can choose any process variable to plot.



FIG. 7: Utilities for plotting time histories of slow controls variables are accessible from the *Tools* section of the CLAS12 main menu (left). An example of running MyaViewer and opening a preset configuration file via the *File*  $\rightarrow$  *Load Config* menu is shown on right.

### VI. Logbook Entries and Screenshots

We use the JLab logbook system, and the primary Hall B logbook is called HBLOG and accessible in a web browser at

#### https://logbooks.jlab.org/book/HBLOG

In Hall B there are two primary methods for adding content to the logbook:

- 1. Use the web browser interface after logging in with your personal CUE credentials. That is the normal method used for filling out the shift checklist, updating a shift summary log entry, following up with comments on previous log entries, or adding more complex log entries (e.g. with multiple images).
- 2. Use our Hall B GUI that facilitates quickly sending single screenshots to the HBLOG logbook as user=clasrun. This is accessed via the "logbook entry" item from the desktop menu, or via the following script in a terminal:

#### logbookEntry.sh

This is also the preferred method for taking screenshots and will always save them in \$HOME/screenshots with timestamped filenames. See Figure 8 for details.



FIG. 8: Upon first opening the logbook/screenshot GUI (top left), only the log title has been automatically initialized (with the current run number). After clicking the "Screenshot" button (top right), it is waiting for you to left-click in the window you desire to capture (clicking the desktop instead of a window will capture the entire desktop). After taking a screenshot (bottom left), a small version of the screenshot and its filename on disk are automatically displayed. Note that the "Screenshot" button can be used repeatedly to change the screenshot if you do not like the previous result, or just want to take more screenshots. The "Submit" button can be used to generate an entry in the HBLOG logbook, and after success the entry number will be displayed (bottom right).

#### VII. Accelerator Screens

The accelerator's screens are accessed from the main CLAS12 menu via the *JMenu* button. This uses the hbops account on hlblo0, a machine owned and maintained by the accelerator group. If a prompt requests a username, password, or terminal type, just press *Enter*. The location of the button on the CLAS12 menu and the JMenu screen that should appear are shown in Figure 9.



FIG. 9: The location of the button to access the accelerator screens from the CLAS12 controls menu (left) and the resulting accelerator JMenu main screen (right).

# VIII. Paging System Experts

Paging on-call experts is available from the main CLAS12 controls menu via the *Page Experts* button at the very top of the screen. This will open a dropdown menu to choose the desired subsystem, and then open a new window in which to enter a message to be sent to the corresponding expert, as illustrated in Figure 10.



FIG. 10: The dropdown menu for choosing which expert to page (left) and the resulting dialog window in which to enter the message contents (right).

# IX. Slow Controls Contacts

The individuals to be contacted for Hall B slow controls are shown in Table I. The first point of contact for shift operations is always the on-call controls expert, accessible from the paging system described in Section VIII of this document and the phone number in the first row of Table I. Additional contacts are listed in the table as a fallback.

On-Call		757-748-6922	
	Nathan Baltzell	757-259-5902	baltzell@jlab.org
General	Ken Livingston		kliv@jlab.org
	Wesley Moore	757-259-6033	wmoore@jlab.org
	Bryan McKinnon		mckinnon@jlab.org

TABLE I: Hall B slow controls contacts.